ASTER: The Spaceborne TIMS

Anne B. Kahle
Jet Propulsion Laboratory
4800 Oak Grove Drive, MS 183-501
Pasadena, CA 91109

The use of multispectral thermal infrared remote sensing has been demonstrated fora number of years with TIMS and a few other airborne sensors, but advancement has been limited by lack of general availability of the data. At last, high-spatial-resolution orbital multispectral thermal infrared data will become available worldwide with the launch of ASTER in 1998.

ASTER is a facility instrument provided for NASA's EOS AM-1 platform by the Japanese Ministry of International Trade and Industry (MITI). The instrument has three separate subsystems, which can be operated independently. These are the visible and near-infrared (VNIR) subsystem with three wavelength channels at 15 m spatial resolution, the short wavelength infrared (SWIR) subsystem with six wavelength channels at 30 m resolution, and the thermal infrared (TIR) subsystem with five wavelength channels (comparable to TIMS bands 1, 2, 3, 5, and 6) at 90 m resolution. The VNIR includes a single spectral band (0.76-0.86 μm) radiometer inclined backward at an angle of 27.6° to the other sensors to provide a same-orbit stereoscopic imaging capability.

A wide dynamic range and multiple gain settings will help ensure useful data for a variety of investigations. The swath width for all three systems is 60 km. The ASTER instrument has a cross-track pointing capability of ±8.55° for the SWIR and TIR subsystems, and ±24° for the VNIR subsystem. This gives cross-track observing ranges on the ground of approximately ±136 km and ±343 km respectively, ensuring that any point on the globe is accessible at least once every 16 days for the SWIR and TIR, and once every five days for the VNIR. Standard data products will include (among others) surface radiance in all wavelength regions, surface kinetic temperature, surface emissivity, and a limited number of Digital Elevation Models (DEMs).

ASTER data will be acquired and processed according to specific user requirements identifying acquisition time, gain, wavelength region, and data product. For daytime observations, the user may request that any or all of the three subsystems be operated. For nighttime observations, typically only the TIR subsystem will be employed, but it is possible to request both TIR and SWIR at night for hot volcanic targets. Current plans are that all EOS investigators, and other scientists approved by NASA or MITI will be allowed to submit requests for data acquisition over their targets. Additionally, the ASTER Science Team will define targets such as active volcanoes, glaciers, and areas of significant land cover change which should be monitored routinely, and a one-time global map will be created over the six-year life of the mission.

ASTER: The Spaceborne TIMS

Anne B. Kahle
Jet Propulsion Laboratory
4800 Oak Grove Drive, MS 183-501
Pasadena, CA 91109

The use of multispectral thermal infrared remote sensing has been demonstrated for a number of years with TIMS and a few other airborne sensors, but advancement has been limited by lack of general availability of the data. At last, high-spatial-resolution orbital multispectral thermal infrared data will become available worldwide with the launch of ASTER in 1998.

ASTER is a facility instrument provided for NASA's EOS AM-1 platform by the Japanese Ministry of International Trade and Industry (MITI). The instrument has three separate subsystems, which can be operated independently. These are the visible and near-infrared (VNIR) subsystem with three wavelength channels at 15 m spatial resolution, the short wavelength infrared (SWIR) subsystem with six wavelength channels at 30 m resolution, and the thermal infrared (TIR) subsystem with five wavelength channels (comparable to TIMS bands 1, 2, 3, 5, and 6) at 90 m resolution. The VNIR includes a single spectral band (0.76-0.86 μm) radiometer inclined backward at an angle of 27.6° to the other sensors to provide a same-orbit stereoscopic imaging capability.

A wide dynamic range and multiple gain settings will help ensure useful data for a variety of investigations. The swath width for all three systems is 60 km. The ASTER instrument has a cross-track pointing capability of ±8.55° for the SWIR and TIR subsystems, and ±24° for the VNIR subsystem. This gives cross-track observing ranges on the ground of approximately ±136 km and ±343 km respectively, ensuring that any point on the globe is accessible at least once every 16 days for the SWIR and TIR, and once every five days for the VNIR. Standard data products will include (among others) surface radiance in all wavelength regions, surface kinetic temperature, surface emissivity, and a limited number of Digital Elevation Models (DEMs).

ASTER data will be acquired and processed according to specific user requirements identifying acquisition time, gain, wavelength region, and data product. For daytime observations, the user may request that any or all of the three subsystems be operated. For nighttime observations, typically only the TIR subsystem will be employed, but it is possible to request both TIR and SWIR at night for hot volcanic targets. Current plans are that all EOS investigators, and other scientists approved by NASA or MITI will be allowed to submit requests for data acquisition over their targets. Additionally, the ASTER Science Team will define targets such as active volcanoes, glaciers, and areas of significant land cover change which should be monitored routinely, and a one-time global map will be created over the six-year life of the mission.